DOCUMENT RESUME

ED 299 872 HE 021 755

AUTHOR Sherman, Lawrence W.; Woy-Hazleton, Sandra
TITLE The Student Team Project: A Long-Term Cooperative Strategy in Graduate Environmental Studies.
PUB DATE Jul 88
NOTE 18p.; Paper presented at the Triennial Convention of the International Association for the Study of Cooperation in Education (4th, Tel Aviv, Israel, July 5-8, 1988).
PUB TYPE Reports - Descriptive (141) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS College Instruction; College Programs; *Cooperation; *Environmental Education; *Graduate Students; Graduate Study; *Group Activities; Higher Education; Masters Degrees; Problem Solving; Small Group Instruction; Student Attitudes; *Teaching Methods; *Teamwork

ABSTRACT

A year-long, cooperatively structured, student team strategy is described that is being used as a major component in an interdisciplinary Master of Environmental Science degree program. The general philosophy of the degree program and the rationale for including the Student Team Project (STP) are described. The most basic goal of the program is the teaching, learning, and direct application of an algorithm for environmental problem-solving. The STP is a direct experiential application of this 10-step cyclic algorithm. The other project goals are: acquiring good team skills and gaining an understanding of the importance of such skills in successful cooperative group research, and developing good research skills and professionalism in oral and written presentations. The similarity between the STP technique and other small group techniques is discussed. Evidence for the positive impact of the STP experience is presented, along with examples of the projects that the teams have produced. Specific problems associated with the STP technique and potential solutions are also presented. The following are appended: figures showing the Master of Environmental Science curriculum and the problem-solving process; a listing of STP reports; and two STP prospectuses. Contains 14 references. (Author/KM)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED299872

The Student Team Project: A Long-term Cooperative Strategy In Graduate Environmental Studies.[1]

Lawrence W. Sherman and Sandra Woy-Hazleton, Institute of Environmental Science, Miami University, Oxford, Ohio 45056, USA,

ABSTRACT. The primary objective of this paper is to describe an extended, year-long, cooperatively structured, student team strategy which is being used as a major component in an interdisciplinary Master of Environmental Science degree program. The general philosophy of the degree program as well as the rationale for including the Student Team Project (STP) is described. The most basic goal of the program entails the teaching, learning and application of an algorithm for environmental problem-solving. The STP is a direct experiential application of this 10-step cyclic algorithm. The similarity between the STP technique and other small group techniques is discussed. Evidence for the positive impact of the STP experience is presented along with examples of the projects which these teams have produced. Specific problems associated with the STP component, as well as potential future solutions to these problems, are also presented.

---

[1] A paper presentation to the Fourth Triennial Convention of the International Association for the Study of Co-operation in Education, July 5-8, 1988, Tel Aviv, Israel. The development and preparation of this paper was made possible through the support of the Provost's Office, the Institute of Environmental Sciences, and the Dean of the School of Education and Allied Professions of Miami University. Dr. Sherman is an Associate Professor in the Department of Educational Psychology and Dr. Woy-Hazleton is the Deputy Director of Academic Affairs for the Institute of Environmental Sciences. Requests for reprints should be sent to L. W. Sherman, Department of Educational Psychology, Miami University, Oxford, Ohio 45056.

BEST COPY AVAILABLE

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

Lawrence Sherman

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☑ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

HE 021 755

INTRODUCTION

One of the traditional criticisms of university instruction suggests that it is out of touch with the realities of the world in which we are preparing students to be employed: ie., the "Ivory Tower" criticism. The interdisciplinary graduate program offered by Miami University's Institute of Environmental Science (IES) is an attempt at ameliorating this problem by making the instructional environment of graduate students more closely congruent with the demands and responsibilities of employment. Foremost among these demands is the ability to perform efficiently as a team member in solving problems and establishing environmental policies. It is a rare occasion in the world of government or business that decisions and solutions to problems are made by independent individuals. More often decisions are the action of interdependent groups such as state legislative committees, town councils, community boards of education, corporate boards of directors, boards of trustees, etc. University instruction has traditionally been perceived by many as an individually competitive environment where, with the exception of certain sports such as football and basketball, helping one's peers has been viewed as a form of cheating. The irony of this description is that the graduates of such programs are many times employed by large corporations and government institutions in which they must participate and function as effective members of teams. From this perspective perhaps university instruction is somewhat "Ivory Towerish" if it maintains this individually competitive model of instruction for their students and teachers. After all, even the faculty who instruct these students function cooperatively on a variety of departmental and university committees which create curriculae, set policy, and even negotiate with their institutional administrators who themselves function as a team representing their Board of Trustees. The following paper is a description of a major instructional component designed with the intention of providing small group team experiences which might be more relevant to the working environments where our graduate students are eventually employed. This small group experience has been entitled the Student Team Project, or STP.

While the International Association for the Study of Cooperation in Education has traditionally been concerned with the research and applications of cooperative pedagogy in the elementary and secondary school setting, recent interest in the uses of these strategies in the college and university environment are also being addressed (Sherman, 1986). The articles contained in the recent issue of the journal, Educational Leadership (November, 1987), imply that instruction in the applications of cooperative strategies at both the undergraduate pre-service teacher training level as well as graduate level instruction of educational administrators is warranted. Disciplines other than education (eg., industrial and organizational Psychology, recreation and sporting, etc.) have had a continuing concern or begun to take a new interest in cooperation as well (See Kohn's (1986) book for further descriptions of the benefits of cooperation in a variety of disciplines). Influenced by Kurt Lewin, Morton Deutsch's (1949) earlier concerns with the positive effects of cooperative groups on problem-solving are still highly relevant. The general term "cooperation" is now becoming defined in terms of very specific and detailed conditions: eg., Slavin's (1983) classic article defines six

types of small group techniques based on two types of "task structures" and three possible "incentive structures." The present paper describes the Student Team Project (STP) as applied at the graduate Master's degree level. While having some similarity to Aronson's Jigsaw method (Aronson et al., 1975), the STP is most similar in structure to Sharan's Group Investigation (GI) model and would be described in Slavin's (1983) terms as one involving task specialization and group reward for a group product. The problem-solving strategy which the STP's are using have an additional Lewinian influence stemming from the late Ronald Lippitt's work on planned change and the use of social engineering grounded in social science (Lippitt, Watson & Westley, 1958, especially, chapters 5 & 6, pp. 91 - 143).

Before proceeding further some background information on the philosophy of Miami University's IES Master's in Environmental Science program would be relevant to a more thorough understanding of the inclusion of the STP as a major component of this degree program. First the IES program will be discussed, followed by a more detailed description of the STP. Benefits and problems associated with the STP will also be pointed out, as well as potential future solutions.

THE INSTITUTE OF ENVIRONMENTAL SCIENCE

The Master of Environmental Science (M. En.) professional degree program at Miami University is one of the oldest and largest such programs in the United States (Lang, 1983). It has an excellent reputation nationally for curriculum, quality of instruction, internships, and success in placement of graduates. It is the largest Master's program at Miami University, with 60 to 70 students in the program and 20 to 25 entering students each year. Its graduates are in 37 states, including Alaska and Hawaii, and the District of Columbia, as well as 12 foreign countries.

The M. En. degree was developed in 1969 because of a need to educate individuals with a comprehensive understanding of environmental problems and the skills to solve them. Positions for environmental specialists are available at all levels of government and in the private sector. Almost every state government, regional council, municipality, county government, special district and public utility has a complement of persons working on environmental problems. The professional Master's degree, the M. En., has become the standard for career professionals and especially for upper level positions in environmental fields in the public sector.

The IES curriculum focuses on problem solving that is comprehensive, considering all major dimensions of a problem, rather than concentrating on partial solutions. It also seeks to develop students' ability to work in and lead interdisciplinary teams and to work effectively with government officials, business leaders, and the public.

The IES program is interdisciplinary; students are recruited and classes are taught in such a way as to reinforce this concept. Thus, an important objective is to have all students understand the terminology, methods, and theory of the various disciplines in order to respect the

contribution each has to make to the solution of environmental problems. Oral and written communication, graphic media, and computer literacy are stressed throughout the program. This is to ensure that each graduate has an adequate grasp of these tools to carry through on problem solutions.

Students take a 17-hour core curriculum normally completed in one year (See Figure 1). They also choose areas of concentration which account for a minimum of 14 more credit hours. Finally, there is a research requirement of at least six credit hours which may be either an internship, a practicum, or a thesis. A comprehensive two-hour oral examination is taken at the completion of the core curriculum.

The core curriculum includes a survey of principles and applications, methodology, impact assessment, policy-making and administration, statistical analysis and mathematical modeling, field measurements, and a student team project. The core curriculum not only provides the necessary background on the nature of environmental problems and the approaches used to solve them, but it also provides a common frame of reference for entering students. Working with other students in the first year over a wide range of topics helps develop a deeper respect and appreciation for other people and the contribution of various disciplines.

One of the central themes running throughout the core curriculum is an environmental problem-solving algorithm. The development of this algorithm was primarily influenced by Lippitt et al's (1958) thoughts on planned change, especially chapters 5 and 6. IES's solution may be seen in Figure 2 which describes the 10-stage cycle.

The degree prepares students for work in the public service sector (government, education, or nonprofit environmental organizations) as well as for private consulting and corporate environmental services. In our discussions with persons who are in professional practice, they repeatedly emphasize the importance of the content we have incorporated into our curriculum including:

1) Knowing how to approach and design a solution for an environmental problem,

2) Understanding the complexity and ambiguity of environmental problems,

3) Knowing how to work with and lead teams of people with different backgrounds,

4) Having quantitative competence,

5) Understanding the institutional aspects of environmental problems,

6) Having competence in communication, both orally and in writing.

STUDENT TEAM PROJECT

One of the highlights of the core curriculum is the year-long public service Student Team Project (STP). An integral part of the first year experience in the IES program, the STP stresses 1) the interdisciplinary nature of environmental problems and their solutions, 2) the importance of team work in problem solving, and 3) the responsibility of professionalism in oral and written presentations. The emphasis on problem solving is built into the program in the principles and applications, methodology and measurement courses. With the team project, this learning is applied by groups of 3 to 6 students working on problems identified by local governments or nonprofit organizations. They work closely with an agency/sponsor and a faculty committee. Each team makes two public, oral presentations and delivers a completed report to the sponsoring organization at the end of the academic year.

Each public service project has three components which must work together smoothly to be successful: the sponsor, the faculty advisory, and the student team. During the summer the IES directorate identifies four or five projects for the incoming class. These projects are most often proposed by sponsors who have worked with the institute in the past, but they may also be initiated by the IES when members feel a relevant problem exists. Considerations for projects include:

1) The definition of a problem with sufficient complexity to require an interdisciplinary team to accomplish the task;

2) A project of some importance to the sponsor that has not been done because of personnel or resource constraints;

3) A willingness by the sponsor to assign a contact person for the team;

4) A project which can reasonably be completed within a nine month, two semester time period;

5) a task which is challenging, yet within the capability of first year graduate students to do well.

After the projects are identified, advisory committees are formed of faculty and community experts to provide guidance and resources for the team. On the first day of class the students are presented with synopsis of the possible projects and presentations are made by the various sponsors (See Appendix A for an example of a sponsor's synopsis). The students make known their first and second preferences and the IES instructor then constructs the teams. Given the diversity of the students and the variety of projects it has generally been very easy to divide the class into suitable teams. While the primary concern is to honor as much as possible, all first choice preferences, we also take into account the students' undergraduate major and intended areas of concentration. It is desirable to have a good mix of background and to avoid single gender teams.

The class carries two hours of credit each semester and it meets

formally once a week. The teams are also expected to meet at least once a week on their own. The classroom time is devoted to helping the teams in general, discussing topics such as group dynamics, techniques of interviewing, the use of audio-visual equipment, questionnaire construction, methods of data analysis, etc. Most of these topics are discussed in great depth in other IES core classes, the point here is to apply to specific projects the processes learned about in other courses.

BENEFITS. The STP serves two important functions including 1) a cooperative, interdisciplinary, team learning, problem-solving experience, and 2) a public service project which benefits communities and other organizations in southwestern Ohio and southeastern Indiana. These two functions provide a rich learning experience which highly parallels and is congruent with the interdisciplinary structure of the Institute of Environmental Sciences. From a more personal perspective as faculty members who have participated as advisors to several teams, we believe that the interdisciplinary guidance and involvement from a team of expert faculty keeps us (the university faculty) in touch with the "real world" as well. Since 1971 when the STP component was formally introduced, more than 60 projects have been completed (See Appendix B for examples of projects and sponsors).

There are three major educational goals for the STP class:

1. To learn the importance of systematic problem-solving by applying the IES algorithm to specific local environmental problems.

Students are generally skeptical about "methodology" and they have often had little experience in developing good organizational skills. In part this may be the result of undergraduate education which confuses systematic approaches with rote learning and models with rigid, authoritarian frameworks. During the first year in the IES classes, efforts are made to demonstrate the algorithm as a flexible, reflective process used by all problem solvers and decision makers, even though the steps may not be consciously acknowledged or they may have different labels.

Another disturbing tendency is for students to compartmentalize their learning. Even when three classes during the first semester talk about the same concepts, only the rare student sees the relevance and transferibility from class to class. In the STP the application of specific methods of statistical analysis, measurements, data collection, etc., learned in other coursework is explicitly expected.

A major insight gained by almost all students in the program is the importance of the first steps --- problem definition and the setting of problem boundaries. The tendency of the students is to immediately think about alternative solutions to the problem which has been clearly and succinctly defined for their synopsis. But they soon learn that sponsors, faculty advisors, and the other team members may have quite different conceptions of the problem. Arriving at a consensus on the definition and wording of a problem statement and boundaries is crucial to the success of the project. Teams which have treated these steps casually or have significantly deviated from the agreed upon problem definition have encountered difficulty in producing a good report later.

The same is true for the next two steps, setting goals and objectives and constructing a study design. The most successful teams are those which have established good relationships with their sponsors and advisors. That is, they early on seek guidance and establish regular and frequent meetings with both groups. To do this students must overcome a tendency to wait until they have enough background or until they have something written about which they may seek advise. Such excuses and avoidance may lead to costly mistakes in terms of research time and effort.

The IES course coordinator for the STP attempts to insure that these four essential steps (Problem definition, setting boundaries, determining goals and objectives, and constructing a study design) are successfully undertaken during the first semester of the project. Written progress reports are required for each step and the first oral presentation covers this part of the process.

2. Acquire good team skills and gaining an understanding of the importance of such skills in successful cooperative group research.

For most graduate students, their entire education has focused on individual achievement. They are again skeptical that their work situation will be any different: eg., the myth of the rugged individual entrepreneur runs deep. They instinctively dislike "group projects" because of a distrust of equitable distribution of workloads and rewards. Negative attitudes range from "I could do this better myself," to "Why should I work when so-and-so isn't?"

Another aspect that the students initially dislike about the STP format is that the selection of a team leader is intentionally discouraged; instead, consensus decision--making by the whole team is encouraged. Persons with strong personalities and leadership abilities often emerge as dominent forces on the teams, but there is no formal recognition of this status. And, inequities do abound in the amount of work done by some members. The IES course coordinator tries to alleviate this problem by insisting that all team members be physically present until the project is finished and by distributing peer evaluations once each semester.

Another important role for the IES course coordinator is to emphasize the development of skills for organizing time, division of labor, responsibility for meeting deadlines, and the need for group constructive criticism. Team work entails the ability to delegate authority and divide responsibility for tasks. In addition, members must trust that others will perform their tasks well and on time.

3. The development of good research skills and professionalism in oral and written presentations.

Students need to develop an appreciation for the mechanics of research, the logic of literature searches, and the need for good background information. They need to become familiar with common sources and how to find obscure information. In addition, they need to learn when to stop. Perhaps the greatest difficulty is learning to make

a reasonable estimate about how much time it takes to do research, to construct a survey, conduct an interview, analyze data, and put together the final document. These skills are the ones most often cited by graduates as what they "learned" from their STP experience. Every communication from graduates, whether formal questionnaires or informal discussions, reveals their overwhelming support for the STP. As one student said:

> "I feel that the STP was a valuable experience. It gave me the opportunity to work in a group and learn all the triumphs and frustrations as well as methods of dealing effectively with and within a group. That cannot be learned in any classroom. I also enjoyed working on a fairly complex project from beginning to end."

From a student's perspective the primary benefits of the STP experience involve learning how to take both individual as well as group responsibility for completing a project. The interactions among STP members as well as between the STP groups and their clients allow students the opportunity to develop interpersonal communication skills, as well as learn how to set reasonable goals and objectives. Since the students come to the teams from a variety of undergraduate programs and majors, in the STPs they must learn how to utilize available human resources. STP members learn the skills of negotiation and how to gain group consensus. They also have an opportunity to see how well they have learned most of the content of their core course sequence, most specifically the 10-step problem-solving algorithm. The feedback from their peers as well as faculty advisors can also indicate what difficiences individual members might have and suggestions for remediation or compensation can be communicated early in the program.

Benefits accrue not only to the students, but also to the sponsors. The recommendations of the teams have been implemented in a high percentage of the projects, and the sponsors have often wanted to have another student team to work on projects in subsequent years. One project looked into a county wide program for solid waste disposal. This has now become a standard source of information in Butler county. Another project succeeded in transforming a dangerous, abandoned gravel pit in the city of Fairfield, Ohio into a community asset. Several energy-related projects done for the Butler Rural Electric Cooperative have resulted in improved energy management for the cooperative and lowered electrical bills for its customers. This also resulted in a very interesting and unsolicited publication (Brown & Walters, 1982). The Butler Rural Electric Cooperative has even established and is presently funding an IES Graduate Fellowship. The Cincinnati Zoo has been able to use its wild animal educational programs more effectively, as well as show to others the kind of success that is possible in such a program. In a subsequent project, exhibit signs for zoo visitors have been improved. Similar success stores can be recited for about two thirds of the projects. Even the projects that have not as yet been implemented cannot be written off as failures, because in some, the implementation takes several years and not enough time has elapsed to evaluate the influence of the STP.

PROBLEMS. While we want to emphasize the positive benefits of the Student Team Project, there are many problems on which we are

continually working. One of the most persistent problems is associated with the previous undergraduate training which most of these students have experienced. More specifically, they come from highly competitive and individualistic academic experiences which have influenced their expectations concerning "traditional" university learning. It is sometimes difficult to convince the students of the importance of team learning. This is also complicated by Miami University's national image, which is perceived by many as being a highly competitive and prestigious institution , a "Public Ivy" (Moll, 1985). Even the traditional scheduling of graduate classes at this university does not provide for clearly defined times in which interdisciplinary team meetings can take place. The larger the STP group the more difficult it is for both faculty and students to negotiate meeting times. Consequently not all team members or faculty advisors are able to attend meetings at the same time. We feel this can create gaps in communication and effective use of resources.

Parallel with the importance of team learning is the need to instill in the students a sense of responsibility to do a good job. Early on it is necessary to motivate the students with references to career development, reputation of the institute, and self-satisfaction. The STP must rely quite heavily on peer pressure to have students do a good job because the grade incentive to do well in the STP is not great. The course carries a total of four hours of pass/fail grade. The chances of receiving an F are not taken too seriously in a group effort. Although individual interim grades of unsatisfactory have been given based on the peer evaluations, the grade is not seen as the motivator in this class, nor is that desired. The problem associated with this, however, is a tendency for students to put the project in secondary importance when there is competition from other course obligations for their time and effort at various times in the semester. Intrinsic motivation and peer pressure must therefore be in the direction of a positive goal orientation.

Perhaps the most persistent problem has been encountered with regard to deadlines, specifically completing the project by the end of the second semester. The IES coordinator has been hesitant to enforce strict deadlines in favor of a product worthy of sponsor acceptance. The problems with the final report run from teams which have divided tasks to the extent that team members worked individually and have only come together in the end to staple segments together, to teams where one or two individuals have written most of the document. Generally the complexity of the problem and work demanded to complete it mitigates the later tendency, more often the problem is integrating the work of all members into a cohesive report. The students have an inclination to avoid critical editing. Team cohesion and cooperation face the greatest difficulties when members must criticize each others' work. Those teams that avoid blow-ups for the sake of harmony generally produce a less coherent final document. Those groups that early on learn to give and take peer criticism do better in the long run.

SOLUTIONS. Recent concern about the lack of professionalism in teams that may see the STP as a secondary project has lead the IES coordinator to place more formal requirements on the teams including time sheets and expense sheets, a formal style guide manual which is now

mandated by the Institute, and final reports will be bound and distributed selectively. Since our graduate students come from a variety of undergraduate backgrounds, their writing style and skills are equally diverse. While not trying to stifle the creative solutions which STPs generate, we believe the style manual will provide greater consistency in the presentation of written reports and it certainly emphasizes the importance of presenting research in a professional yet flexible format. We believe this is not an unreasonable demand since most employers would do likewise.

In the past, calendar deadlines have been suggested but there have been no sanctions for missing the date. As mentioned above, the Institute has been more concerned with a credible project than a merely timely one. Starting this year, however, we have initiated a requirement that teams which have not finished by May 15, 1989, must sign up for one more hour of summer school to finish the report. The extent to which this provides an escape for some students rather than an incentive to finish has yet to be determined.

Instilling a sense of pride and professionalism in the students is still believed to be the best way of motivating the teams, helping them get the most out of the experience and producing a useful report. One way of underscoring the importance and relevance of teamwork and the STP experience to their future employment, has been to invite graduates of the program to participate in classes and brown bag lunches, to discuss their working environment and their evaluation of their IES preparation. Another way of enhancing this attitude has been a change in the name of the course from Student Team Project to Public Service Project, which more closely reflects one of its purposes.

More formal meetings between the STPs and their faculty advisors will be established in the future. This should enable the STP members to use their faculty advisors more efficiently. More group simulation experiences will also be provided to help students understand the importance of and gain further skills for successful group participation. We hope these simulations will heighten the students' awareness of the necessity of effective interpersonal skills in dealing with each other as well as their sponsors.

The most successful projects are those which are clearly defined and are expected to produce a clearly understood product (report, recommendation, map, manual, conference, etc.). A successful team is one whose members believe their work is important and therefore place the group product ahead of personal concerns. They learn to respect each others' diverse talents, trust the ability of each to perform well, and take on the responsibility of doing a good job. Pride in their work substitutes for a transcript grade. The Institute of Environmental Science and the sponsors contribute to instilling this pride when they demonstrate how important they feel these projects are to them.

REFERENCES

Aronson, E., Blaney, N., Sikes, J., Stephan, G., & Snapp, M. (1975). The Jigsaw Route to Learning and Liking. Psychology Today, February, 43-50.

Brown, D. W., & Walters, A. (1982). Cooperative poses the questions, grad students search for answers. Country Living, December, 1982, Volume 5.

Deutsch, M. (1949). A Theory of Cooperation and Competition. Human Relations, 2, 129-152.

Educational Leadership, (1987). Volume 45, Number 3, November, pp. 3-75.

Johnson, D. W., & Johnson, F. P. (1987). Joining Together: Group Theory and Group Skills (3rd edition). Englewood Cliffs, NJ: Prentice-Hall.

Kohn, A. (1986). No contest: The Case Against Competition. New York: Houghton Mifflin.

Lang, M. (1983). Institute of Environmental Sciences. Miamian, September, 1983, Oxford, Ohio.

Lippitt, R., Watson, J., & Westley, B. (1958). The dynamics of planned change: A comparative study of principles and techniques. New York: Harcourt & Brace.

Moll, R. (1985). The Public Ivys. New York: Viking Press.

Sharan, S. (1980). Cooperative Learning in Small Groups: Recent Methods and Effects on Achievement, Attitudes, and Ethnic Relations. Review of Educational Research, 50, 241-256.

Sharan, S. & Hertz-Lazarowitz, R. (1980). A Group Investigation Method of Cooperative Learning in the Classroom. In (S. Sharan, P. Hare, C. Webb, and R. Hertz-Lazarowitz (editors), Cooperation in Education . Provo, Utah: Bringham Young University Press, pp. 14-46.

Sharan, S. & Sharan, Y. (1976). Small Group Teaching. Englewood Cliffs, NJ: Educational Technology Publications.

Sherman, L. W. (1986). Cooperative vs Competitive Educational Psychology Classrooms: A Comparative Study. Teaching and Teacher Education: An International Journal of Research Studies, 2, 283-295

Slavin, R. (1983). When Does Cooperative Learning Increase Student Achievement? Psychological Bulletin, 93, 429-445.

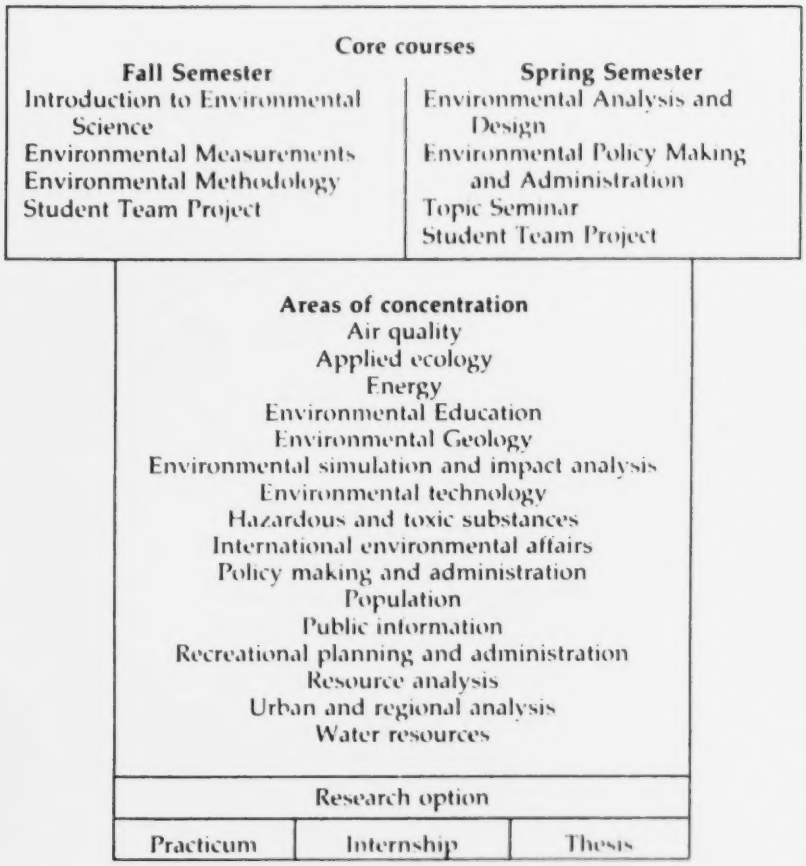

Figure 1. Master of Environmental Science Curriculum

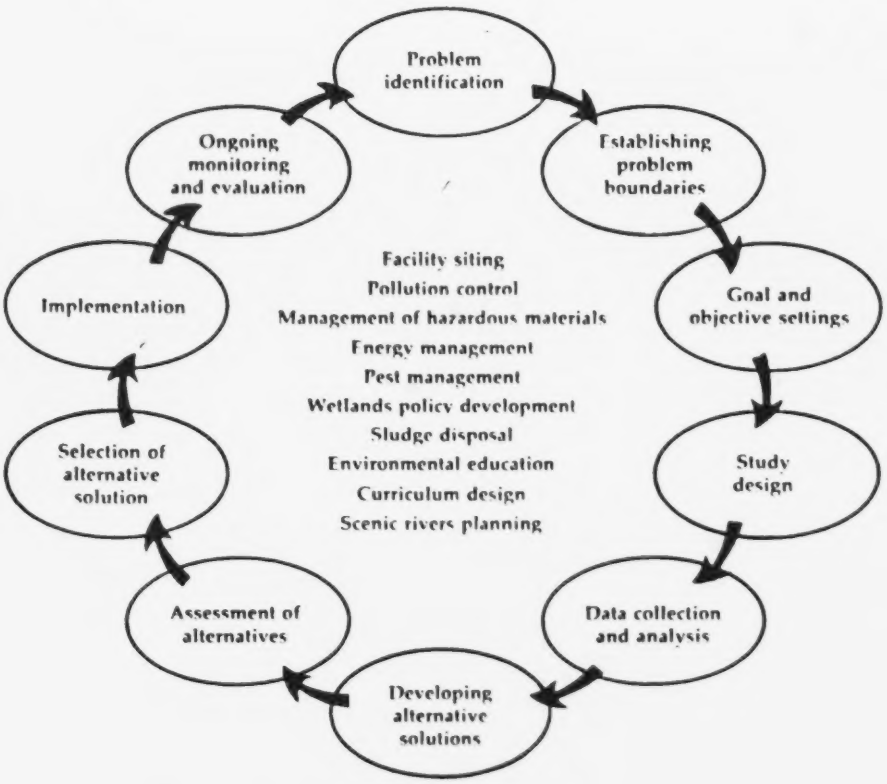

Figure 2. The Problem-Solving Process

APPENDIX A

STUDENT TEAM PROJECT REPORTS

Title	Year	Sponsor
A Communications Proposal	1971	
Plan for the Development of the Miami University-Hamilton Landfill	1971	
Environmental Awareness Unit--AN IES 611 Pilot Project for McGuffey Lab Sch	1972	Miami University
Long Term Water Needs of Oxford	1972	City of Oxford, OH
Parking Facilities of Oxford, Ohio and Miami University	1972	City of Oxford, OH
A Community Impact and Land Use Study of the Laura Stewart Property	1972	City of Oxford, OH
The Climax Beechwood Forest at Hueston Woods	1973	Ohio Department of Natural Resources
A Study of Returnable Containers with Applications to the City of Oxford	1973	City of Oxford, OH
An Improvement Plan for the Bird Sanctuary - Hamilton, OH	1973	City of Hamilton, OH
IES as an Optimal Organization for Community Service - An Analysis	1973	Miami University
Oxford Transportation Study	1973	City of Oxford, OH
An Evaluation of Current and Possible Future Methods of Solid Waste Disposa	1973	City of Oxford, OH
Alternative Disposal Methods for Oxford's Sewage Effluent & Sludge	1973	City of Oxford, OH
A Plan for Developing A Nature Center At the Preble County Historical Cente	1974	Preble County Historical Society
Butler County Parks Recreational Assessment Study	1974	Butler County Parks
Final Report on the Study of The Proposed Route 27-By-Pass	1974	City of Oxford, OH
Brookville Lake - Union County Land-Use Study	1975	Union County, Indiana
Franklin Environmental Awareness Center	1975	City of Franklin, OH
An Environmental Ed. Plan for The Rentschler Forest Preserve & Miami Erie C	1976	Butler County Parks
Increasing Community Awareness and Use of the Middletown Area Recycling Cen	1976	Middletown ARea Recycling Center
Public Preferences for Alternative Solid Waste Collection Systems in Middle	1976	City of Middletown, OH
Report on the IES Center: Assets and Recommendations	1976	Miami University
An Evaluation of the Present Solid Waste Collection & Disposal Methods - Ox	1976	City of Oxford, OH
A Guide to Further the Plan. & Dev. of the Preble Cnty. Historical Center	1976	Preble County Historical Society
Improvement of Hueston Woods State Park Trail System & Nature Center	1977	Ohio Department of Natural Resources
Report on the Thermal Condition of Homes in Butler County, OH	1977	BREC
Appropriate Technologies for Hamilton, OH	1977	City of Hamilton, OH
The Brown-Glover Tract: A Comprehensive Trail Plan	1977	Miami University
The Educational & Recreational Potential of the St. Clair Ave. Gravel Pit	1977	City of Hamilton, OH
Energy Audit: A Proc. & Application to Three Municipal Bldgs in Middletown	1978	City of Middletown, OH
Impacts of a Rural Water System in Butler County, OH	1978	The Water Association
Energy Conservation Survey of Butler County	1979	Butler County Extension Office
A Park Planning Process for the Butler Cnty. Park Dist. - Governor Bebb Res	1979	Butler County Parks
The Oxford Energy Project	1979	City of Oxford, OH
Oxford, Ohio Hazardous and Toxic Substances	1979	City of Oxford, OH

APPENDIX A

Title	Year	Sponsor
A Step Toward Peak Demand Management	1979	BREC
Richmond Energy	1979	City of Richmond, IN
Miami Oxford Recycling Enterprise - MORE	1980	MORE
Hydrothermal Energy	1980	BREC
Hazardous Chemicals: A Community and Secondary Education Project	1980	
A Comprehensive Master Plan for Bull's Run Arboretum	1980	Bull's Run Arboretum
Miller Brewery Solid Waste Management	1980	Butler County Water & Sewer Dept.
A Master Plan for Joyce Park, Hamilton, OH	1981	City of Hamilton, OH
Miami University Energy Conservation	1981	Miami University
Wind Energy	1981	BREC
Solid Waste Management in Butler Co, Ohio	1981	IES
Trenton Flooding	1981	City of Trenton, OH
Dual Fuel Heating Program	1982	BREC
Management Plan for the Joseph Bachelor Wildlife & Game Reserve	1982	Miami University
Solid Waste Disposal Alternatives, Oxford, OH	1982	City of Oxford, OH
Middletown, OH Sanitary Landfill Study	1983	City of Middletown, OH
Feasibility of Site Usage Following Hazardous Waste Remedial Actions	1983	City of Hamilton, OH
Hydrogeologic Investigation at the Middletown Sanitary Landfill	1983	City of Middletown
Ground Heat Pump	1983	BREC
Middletown Leachate Study	1983	City of Middletown, OH
Alternative Funding Sources for the Butler County Park District	1984	Butler County Parks
Flooding: As It is Related to Storm-Water Runoff in Oxford, OH	1984	City of Oxford, OH
Potential Development of the Seven Mile Creek Aquifer by the City of Oxford	1984	City of Oxford
The Effectiveness of Methods To Control The Peak Load Prob. of BREC	1984	BREC
Butler County Litter	1984	Butler Co. Office of Litter Control
An Evaluation of Educ. Tech. Used by the Cincinnati Zoo to Promote Conserv.	1985	Cincinnati Zoo
Recycling Alternatives for Fairfield, OH	1985	Butler Co. Office of Litter Control
The Butler Rural Electric Coop Dual Fuel Program: Evaluation & Recommendat	1985	BREC
Emergency Response Plan For Hazardous Materials Accidents in Oxford	1985	Miami University
The Butler Rural Electric Cooperative Dual Fuel Program: Evaluation & Reco	1986	BREC
Evaluating Sign Effectiveness At the Cincinnati Zoo	1987	Cincinnati Zoo
A Feasibility Study For Establishing A Tallgrass Prairie At Gov. Bebb Prese	1987	Butler County Parks

Appendix B

STP PROSPECTUS--1987-88

Project Sponsor: Butler Rural Electric Cooperative,
Mike Simms, Manager

Project: Peak Load Management and Improved Customer Service

In its effort to conserve energy and keep costs to its customers down, the Butler Rural Electric Cooperative (BREC), carefully monitors its peak demand periods. Rates charged to the rural cooperative by its supplier, Buckeye Power, are based on the highest total amount of electricity used at any one time by its customers. Avoiding new peaks allows the cooperative to maintain current rates. BREC has worked with the IES for many years on projects that have sought to conserve energy usage during peak demand times and to spread usage to other periods. Current concerns are:

1. The feasibility of widespread use of radio switch systems to automatically turn off electric water heaters during a demand surge. BREC would like to evaluate the potential savings to the cooperative and their customers with this system and to determine what incentives would be necessary to induce customers to participate.

2. The feasibility of using electricity to dry grain. Currently, the majority of Butler County farmers use propane to operate drying systems. BREC estimates that electricity would run only $400 per year to perform this function using off peak periods.

3. Analyze the types of customer information important for a useful data base for the cooperative.

STP PROSPECTUS--1987-88

Project Sponsor: Cincinnati Zoo
Barry Wakeman and Laura Canterbury

Project: Research at the Cincinnati Zoo

The Cincinnati Zoo has a very active educational program. It includes among its objectives the promotion of conservation, habitat preservation, appreciation of the understanding of animals in relation to their habitat, and reaching a very broad audience. Part of that audience is comprised of students interested in doing research at the zoo. Given this demand, the education director, Barry Wakeman would like to expand upon a program that is now in effect at the Minneapolis Zoo. In cooperation with the University of Minnesota, a video-tape was produced to introduce prospective researchers to the types of research most appropriate to the Minnesota Zoo setting. Mr. Wakeman would like to have a pamphlet and a tape-slide show to distribute to all individuals and institutions interested in doing work at the Cincinnati Zoo. These materials would detail the on-going research at the zoo, the possiblities of expanded research, the techniques most appropriate for the Cincinnati Zoo setting, the limitations to such research, and the formalities of doing research at the Zoo.